

Lightweight Small-Scale Turbine Generator, Phase I

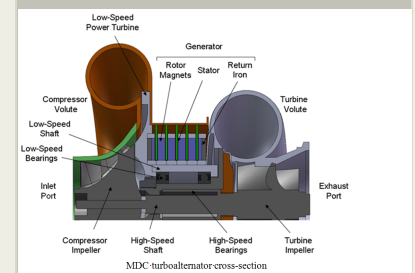
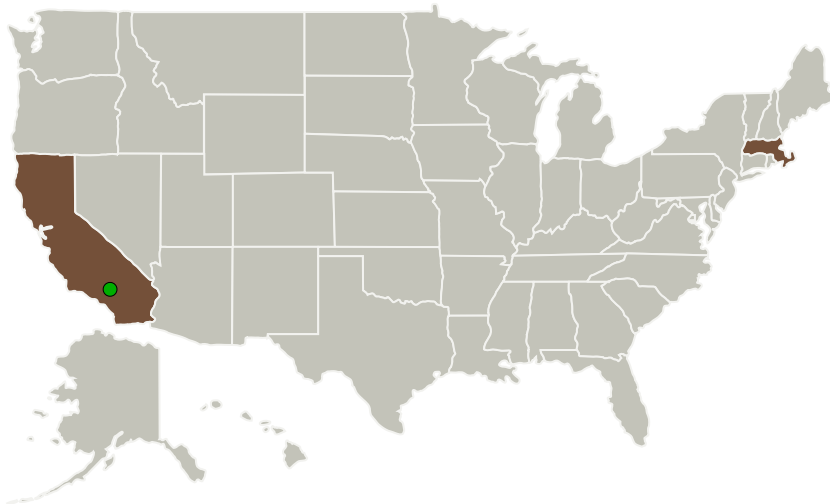
Completed Technology Project (2013 - 2013)



Project Introduction

The proposed innovation is a propulsion technology that will help achieve NASA's Fundamental Aeronautics Program (FAP) goals of reducing emissions and increasing fuel efficiency for high speed flight. NASA's objective to achieve increase the specific power of high efficiency electric components to make a 10 mega-watt onboard power generation and/or utilization feasible for propulsion requires the development of sub-scale technologies to support the development and validation of newer turbo-electric aircraft and embedded boundary layer electric propulsion systems. Compact and lightweight generators scaling from the kW to MW class are needed to transition high speed aircraft to hybrid electric propulsion systems. Metis Design Corp is developing a lightweight, small-scale, gas turbine generator that draws on recent innovations in the fields of permanent magnet generators and turbomachinery, which has a target power density over twice the state-of-the-art and the potential to scale to 100's of kW. The proposed turbine engine uses a lightweight, two-spool configuration that eliminates the need for the heavy reduction gearbox required by state-of-the-art systems. Phase I of this SBIR will develop a preliminary design of the turbine generator sub-system and develop a detailed design, fabricate and test the innovative generator hardware. A follow-on phase II effort will develop a detailed design, fabricate and test the complete turbine generator sub-system.

Primary U.S. Work Locations and Key Partners



Lightweight Small-Scale Turbine Generator

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Organizations Performing Work	Role	Type	Location
Metis Design Corporation	Lead Organization	Industry	Boston, Massachusetts
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

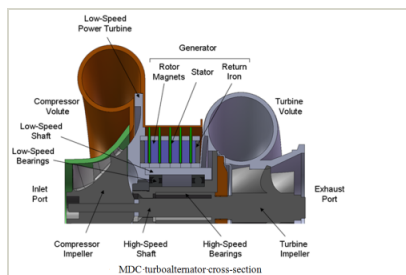
▶ **May 2013:** Project Start

✔ **November 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140367>)

Images

**Project Image**

Lightweight Small-Scale Turbine Generator

(<https://techport.nasa.gov/image/131712>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Metis Design Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Rory Keogh

Co-Investigator:

Rory Keogh

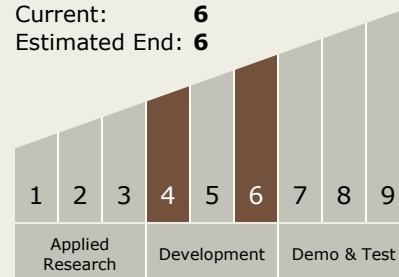
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Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.3 Mechanical Systems
 - └ TX12.3.2 Electro-Mechanical, Mechanical, and Micromechanisms

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System